Dredging Research

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New surface runoff water quality assessment method for contaminated dredged material saves time and money at the planning stage

by Richard A. Price, U.S. Army Engineer Research and Development Center, Environmental Laboratory

The U.S. Army Corps of Engineers, responsible for maintaining navigable waterways, must remove sediments from shipping channels by dredging. A disposal site for these dredged sediments must be determined before dredging begins. If the sediment is contaminated, evaluations of the material must take place, since dredged sediments placed in upland environments are subject to weathering processes that may change their physical and chemical properties. Rain on the dredged sediment may cause surface displacement as well as contaminant discharge in the surface runoff.

Contaminant movement from wet, unoxidized material is mainly associated with suspended solids. As the material dries and oxidizes, suspended solids concentration may decrease. Contaminants such as heavy metals, however, may become more soluble. Therefore, water leaving an upland confined disposal facility (CDF) is regulated as a dredged material discharge.

Current testing protocols use the Rainfall Simulator Lysimeter System (RSLS) for predicting surface runoff water quality from upland CDFs. RSLS is an effective tool, but the procedure is expensive, time-consuming, and can only be conducted at the Waterways Experiment Station. RSLS requires approximately 600 liters of dredged material and up to a full year to complete testing. Half of that time is waiting for natural drying and oxidation to occur. The need for a faster and less expensive response to surface water quality concerns generated research at the Corps' Environmental Laboratory, resulting in the development of the Simplified Laboratory Runoff Procedure (SLRP).

Background of RSLS

Guidance provided in the surface runoff water quality component of the *Technical and Decision-Making Framework for the Management of Dredged Material* (*www.wes.army.mil/el/dots/guidance.html*) requires evaluation of potential water quality problems resulting from storm water discharges when contaminated dredged material is placed in upland environments. The RSLS can predict these effects. Thus, restrictions/treatments, such as controlling movement of suspended solids or providing adequate mixing zones, can be incorporated at the CDF design phase. The testing protocol for surface runoff water quality as described by Skogerboe et al. (1988) has been successfully applied to dredged material at several locations, including Indiana Harbor, Black Rock Harbor, New Bedford Harbor, and Oakland Harbor. Among the contaminants were heavy metals, polyaromatic hydrocarbons, polychlorinated

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byphenyls, pesticides, organotins, and dioxins. The test procedure primarily uses the RSLS in the laboratory (Figure 1) but also was field validated under the Corps' Field Verification Program with a portable RSLS at Black Rock Harbor (Figure 2).

Study results in new method for compliance

The newly developed SLRP is designed to provide a less expensive, rapid response screening evaluation of surface runoff water quality from upland CDFs. It is basically a simple water dilution/extraction procedure (Figure 3) relying on the oxidizing effects of hydrogen peroxide (Figure 4) to simulate the long-term effects of weathering on dredged material. Under the LEDO Program, the SLRP was conducted on a number of sediments and compared to results of the RSLS procedure performed on the same material. The initial results of the research are extremely promising. The SLRP requires as little as two liters of sediment and can be performed in approximately one to three months, depending on analytical turnaround. The SLRP has been shown effective as a screening tool to determine potential water quality problems that will require management of surface runoff water discharge. However, the SLRP at this time is not a standalone test. Where the SLRP contaminant concentrations exceed water quality standards, additional evaluation with the RSLS may be required.

Research to continue

SLRP research under the Long-Term Effects of Dredging Operations Program's Surface Water Quality Work Unit ends in Fiscal Year 1999. Upon completion, the SLRP will be incorporated into the technical framework as a Tier II evaluation.

Application and validation of the surface runoff water quality testing protocol will proceed under the Dredging

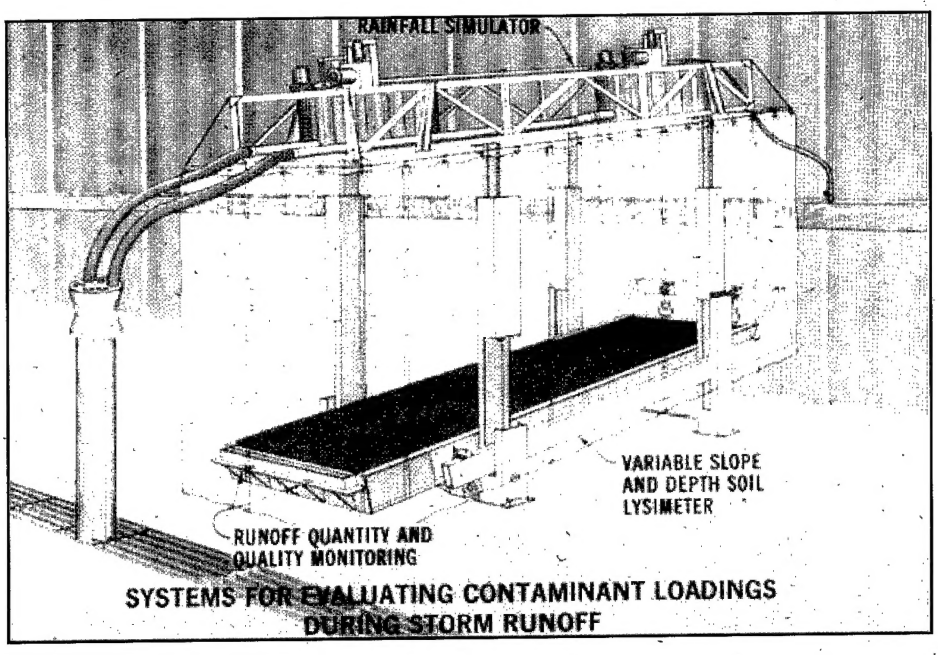


Figure 1. Schematic of the rainfall simulator lysimeter system

Figure 2. The portable RSLS on a CPF at Black Rock Harbor

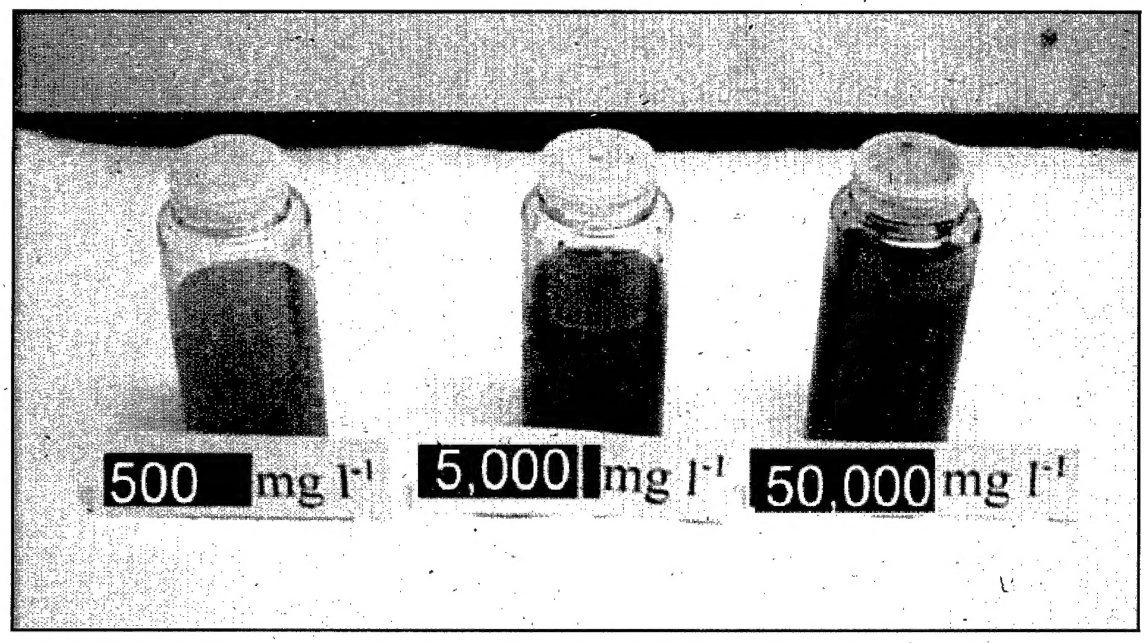


Figure 3. Suspended solids in SLRP runoff samples

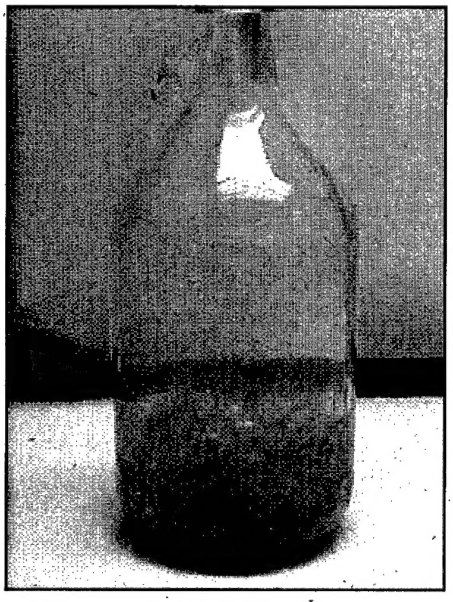


Figure 4. Oxidation of sediment with hydrogen peroxide

Additional information is available from Mr. Richard A. Price, (601) 634-3636, *price1@wes.army.mil* or the manager of the Environmental Effects of Dredging Programs, Dr. Robert M. Engler, (601) 634-3624, *englerr@wes.army.mil.* In addition, other publications on this subject can be found online. They are Technical Notes EEDP-02-3: Upland Disposal Site Management for Surface Runoff Water Quality (*http://www.wes.army.mil/el/dots/pdfs/eedp02-3.pdf*) and EEDP-02-25: Predicting Surface Runoff Water Quality from Upland Disposal of Contaminated Dredged Material (*http://www.wes.army.mil/el/dots/pdfs/eed02-25.pdf*). Another EEDP technical note is in preparation with the proposed title *Application of SLRP to Pearl Harbor Dredged Material.*

Operations and Environmental Research Program; scheduled for Fiscal Year 2000.

Future benefits are time and money savings. It should also be noted that this procedure can be performed by any qualified laboratory with widely available equipment.

Skogerboe, J. G., Price, R. A., and Brandon, D. L. (1988). "New Bedford Harbor Superfund Project, Acushnet River Estuary Engineering Feasibility Study of Dredging and Dredged Material Disposal Alternatives; Report 4, Surface Runoff Quality Evaluation for Confined Disposal," Technical Report EL-88-15, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Articles for Dredging Research requested

***Dredging Research* is an information exchange bulletin for publication of WES-generated dredging research results. Included are articles about applied research projects. The bulletin serves all audiences and is accessible on the World Wide Web in addition to a circulation of 2,800.**

Articles from non-WES authors are solicited for publication, especially if the work described is tied to the use of WES-generated research results. Research articles that complement WES research or cover wide field applications are also accepted for consideration. Manuscripts should include suggestions for visuals and a brief biography of the author and should use a nontechnical writing style. Point of contact is Elke Briuer, APR, at *briuere@wes.army.mil.*

DOTS training Web page adds information about online courses

The U.S. Army Corps of Engineers has developed Internet-based training courses for distance learning. The courses are Dredging Regulations, Dredged Material Management, and Basic Benthic Evaluations. The courses are presented as introductory-level instruction, suited for refresher training and as an opportunity to learn about state-of-the-art methods used by Corps personnel working with dredging and dredging related issues. More information is available online at *www.wes.army.mil/el/dots/training.html.*

More previously published materials placed online

DOTS management has placed all of the Dredging Research Program (DRP) Technical Notes and the DRP summary reports online at *www.wes.army.mil/el/dots/pubs.html*. The technical reports are:

- DRP-95-7 Material Properties Related to Navigation and Dredging: Summary Report for Technical Area 2
- DRP-95-9 Vessel Positioning Survey Controls, and Dredge Monitoring Systems; Summary Report for Technical Area 4
- DRP-95-10 Dredge Plant Equipment and Systems Processes; Summary Report for Technical Area 3
- DRP-96-2 Management of Dredging Projects; Summary Report for Technical Area 5
- DRP-96-4 Analysis of Dredged Material Disposed in Open Water: Summary Report for Technical Area 1

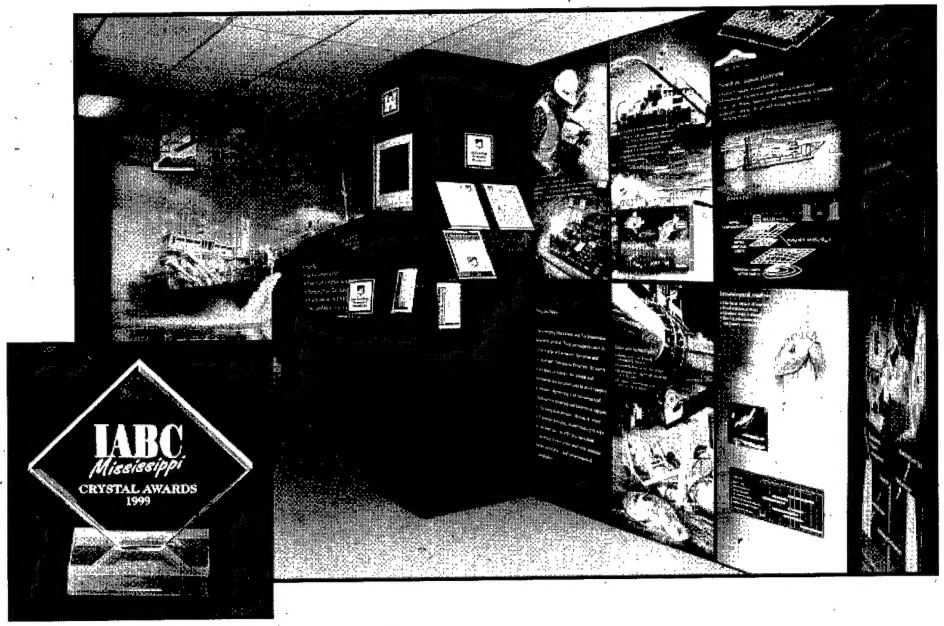
DOER: New research technical notes placed online

- DOER-C2 - Dredged Material Characterization Tests for Beneficial Use Suitability (replaced)
- DOER-C3 - Evaluation of Dredged Material for Phytoreclamation Suitability
- DOER-C4 - Screening Tests for Assessing the Bioreclamation of Dredged Material
- DOER-C6 - Manufactured Soil Screening Test

www.wes.army.mil/el/dots/doer/technote.html

DOER exhibit brings home the Crystal

The DOER 20-foot display recently won the award of excellence, the 1999 Crystal Award, in the category "tradeshow exhibits" from the Mississippi Chapter of the International Association of Business Communicators, the IABC. The exhibit was displayed at the EPA/Corps Sediment Specialists meeting in Charleston during March and at the DOER/LEDO field review meeting in Kansas City, MO, the PIANC meeting in Memphis, and at the WEDA exhibition, all during May 1999.



Who Should Attend?

- ☆ Dredged material testing, assessment, and management specialists.
- ☆ Federal and State regulatory personnel involved in managing, testing, evaluating, or regulating dredged material.
- ☆ Anyone working with contaminated aquatic sediments.

www.wes.army.mil/el/dots
click on "Training"

Additional information is available from:
Ms. Billie Skinner, 601-634-3701
Dr. Robert Engler, 601-634-3624
Mr. Tom Patin, 601-634-3444

Dredged Material Assessment and Management Seminar

11 to 13 January 2000

The Westin Horton Plaza Hotel
910 Broadway Circle
San Diego, CA 92101

sponsored by
U.S. Environmental Protection Agency
and
U.S. Army Corps of Engineers

What is being offered?

The seminar focus is on assessment and testing for waters regulated under the Marine Protection, Research, and Sanctuaries and the Clean Water Acts. Presentations and discussions will include the following:

- ☆ Regulations and Policies
- ☆ Inland, Ocean, and Upland Testing Manuals
- ☆ Sediment Quality Guidelines
- ☆ Corps/EPA Technical Framework
- ☆ DOTS—Technology Transfer
- ☆ Bioaccumulation Testing and Interpretation
- ☆ Chronic Sublethal Testing and Interpretation
- ☆ Dredged Material Management Software DMSMART
- ☆ Dredged Material Management Models (ADDAMS)
- ☆ Beneficial Uses
- ☆ Risk Assessment Application
- ☆ Research
- ☆ Design and Management of CDFs
- ☆ Innovative Technologies
- ☆ Contaminated Sediment Testing and Management

Hotel Information:

A block of rooms has been set aside under the name "Dredged Material Management Seminar" at the Westin Horton Plaza, telephone 619-239-2200. Government rate (in effect at the time of the seminar) plus tax will be available to eligible attendees. **Participants must make their reservations no later than 3 December 1999.**

It is recommended that attendees use the Cloud Nine Shuttle service from the airport to the hotel at $7 one way. Shopping, attractions, and restaurants are within walking distance of the hotel, and trolley service is available in the area.

How do I register?

Seminar registration: There are four ways to pre-register for the seminar:

- ☆ By FAX at 601-634-3528
- ☆ Via e-mail at skinneb@wes.army.mil
- ☆ Online at www.wes.army.mil/el/dots/training/register.html
- ☆ By mail:

  USAERDC, WES
  ATTN: Ms. Billie Skinner, EP-D
  3909 Halls Ferry Road
  Vicksburg, MS 39180-6199

Your registration must provide:

- ☆ Full name
- ☆ Organization and address
- ☆ Telephone number
- ☆ FAX number
- ☆ e-mail address

Pre-registration for the seminar ends on **18 November 1999**. Anyone registered by that date will receive password access to three training modules of DOTS Online Training. Completion of these units will prepare attendees for the technical sessions in the seminar. Registration continues, to include on-site registration, until the seminar begins, pending availability of space. Pre-registration, therefore, is highly recommended to assure attendance.

Note: A registration fee of $50 (cash only) will be collected when you sign in for the seminar and pick up your materials.

Center for Contaminated Sediments announces director

Dr. Michael R. Palermo recently was appointed Director for the Center of Contaminated Sediments (CCS) at the U.S. Army Engineer Research and Development Center's Waterways Experiment Station Environmental Laboratory. Palermo's immediate goals include expansion of the CCS website and development of a more prominent role in distributing contaminated sediment research results and information.

CRDA joins Norwegian company and U.S. Army ERDC in contaminated sediment projects

A Cooperative Research and Development Agreement (CRDA) has been signed by the U.S. Army ERDC and Norwegian Environmental Technology AS (NET), Sandefjord, Norway.

NET is a company with the responsibility to establish a Center for Contaminated Marine Sediments in Sandefjord. The Center's objectives are to cooperate with national and international technology leaders in the field of remediation of marine sediments and to establish cooperation with relevant technology leaders in developing and demonstrating technologies to remediate contaminated sediments, soil, and debris.

NET elected to work with the ERDC's Environmental Laboratory because of the internationally recognized technical expertise and cutting edge research conducted there. The Corps' Center for Contaminated Sediments is a world class repository for information on such sediments and dredged material in the United States. Also, ERDC has unique facilities, such as DoD's most modern environmental quality complex for investigating environmental chemistry and hazardous waste. The world's largest research centrifuge is also located at the WES' ERDC complex.

The agreement with NET will provide Corps research staff with a unique opportunity to field techniques for the handling, treatment, and confinement of contaminated sediments in deep water marine ecosystems. An international scientific contribution will be to demonstrate at field scale the viability of certain U.S. technologies being developed under the Army Corps of Engineers LEDO and DOER Programs. Additional information is available from Mr. Norman Francingues, the laboratory's representative in the CRDA (601) 634-3703, *francin@wes.army.mil.*

1999 Calendar Events

July 11-14 - 6th Symposium of Biochemistry of Wetlands, in Fort Lauderdale, FL. Register: *www.ifas.ufl.edu/~conferweb/wetland.htm*

July 24-30 - Coastal Zone '99, sponsored by NOAA, in San Diego, CA.
POC: *cz99@umbsky.cc.umb.edu*

July 25-28 - 24th Annual Summer Ports & Waterways Conference, sponsored by Transportation Research Board of the National Academy of Science, in Duluth, MN.
POC: *www.nas.edu/trb/* or Joedy Cambridge at (202) 334-2030

August 2-6 - 9th Annual National Gap Analysis Program Meeting, hosted by USGS, in Duluth, MN.
POC: *gap@uidaha.edu*

August 8-11 - ASCE: 1999 International Water Resources Engineering Conference. Information: *www.asce.org/conferences/we99/index.html*

September 1 - 8th Annual Ohio Lake Erie Conference, sponsored by the Ohio Lake Erie Commission, at Bowling Green, OH.
POC: *oleo@www.epa.state.oh.us*

September 12-16 - 12th International Harbour Congress, Antwerpen, Belgium. Includes 4th International Characterization and Treatment of Sediments (CATS) Congress from September 15-17.
POC: *www.tilkviv.be/conf/have.hmt*
or e-mail *have@conferences.ti.kviv.be*

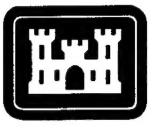
September 13-17 - 8th International Symposium on the Interactions Between Sediments and Water, sponsored by the International Association for Sediment Water Science, in Beijing, China.
POC: *jsc@urbanms.urban.pku.edu.cn*

September 14-15 - Annual Meeting of Great Lakes Commission, in Pittsburgh, PA.
POC: Mike Donahue, 734-665-9135, *mdonahue@glc.org*

September 15-17 - International Specialty Conference on Mercury in the Environment, sponsored by Upper Midwest Section of the Air and Waste Management Association, in Minneapolis, MN.
POC: *melba.hensel@metc.state.mn.us*

September 16-17 - First Annual Great Cities/Illinois-Indiana Sea Grant Water Resources Conference: Improved Decision-making for Water Resources; The Key to Sustainable Development for Metropolitan Regions, in Chicago, IL.
POC: *www.uic.edu/depts/oceps/sea-grant/*
or 312-996-8025

September 24-26 - Biennial Forum on Great Lakes Water Quality, sponsored by the International Joint Commission, in Milwaukee, WI.
POC: *DayJ@windsor.ijc.org*



US Army Corps of Engineers

Dredging Research

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